

General

Guideline Title

Diagnosis and treatment of degenerative lumbar spondylolisthesis.

Bibliographic Source(s)

North American Spine Society (NASS). Diagnosis and treatment of degenerative lumbar spondylolisthesis. Burr Ridge (IL): North American Spine Society (NASS); 2014. 119 p. [636 references]

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: North American Spine Society (NASS). Diagnosis and treatment of degenerative lumbar spondylolisthesis. Burr Ridge (IL): North American Spine Society (NASS); 2008. 133 p. [191 references]

This guideline meets NGC's 2013 (revised) inclusion criteria.

Recommendations

Major Recommendations

The grades of recommendations (A–C, I) and levels of evidence (I–V) are defined at the end of the Major Recommendations field.

Diagnosis and Imaging

What Are the Most Appropriate Historical and Physical Examination Findings Consistent with the Diagnosis of Degenerative Lumbar Spondylolisthesis?

In the absence of evidence to address this question, it is the work group's opinion that obtaining an accurate history and physical examination is important for the diagnosis and treatment of patients with degenerative lumbar spondylolisthesis. Formulating appropriate clinical questions is essential to obtaining an accurate history that can be used in developing a treatment plan for patients. *Maintained from original guideline with minor word modifications; Work Group Consensus Statement*

In patients with imaging evidence of degenerative lumbar spondylolisthesis, the following clinical characteristics have been reported: asymptomatic with only occasional back pain; chronic low back pain with or without radicular symptoms and with or without positional variance; radicular symptoms with or without neurologic deficit, with or without back pain; and intermittent neurogenic claudication. The summaries in the original guideline document are provided as background support to help further define the clinical characteristics that may be associated with a diagnosis of degenerative lumbar spondylolisthesis.

What Are the Most Appropriate Diagnostic Tests for Degenerative Lumbar Spondylolisthesis?

The lateral radiograph is the most appropriate, noninvasive test for detecting degenerative lumbar spondylolisthesis. *Maintained from original guideline with minor word modifications; Grade of Recommendation: B (Suggested)*

In the absence of reliable evidence, it is the work group's opinion that the lateral radiograph should be obtained in the standing position whenever possible. *New consensus statement; Work Group Consensus Statement*

The most appropriate, noninvasive test for imaging the stenosis accompanying degenerative lumbar spondylolisthesis is magnetic resonance imaging (MRI). *Maintained from original guideline; Work Group Consensus Statement*

Facet joint effusion greater than 1.5 mm on supine MRI may be suggestive of the presence of degenerative lumbar spondylolisthesis. Further evaluation for the presence of degenerative lumbar spondylolisthesis should be considered, including using plain standing radiographs. *New recommendation statement; Grade of Recommendation: B*

There is insufficient evidence to make a recommendation for or against the utility of the upright seated MRI in the diagnosis of degenerative lumbar spondylolisthesis. *New recommendation statement; Grade of Recommendation: I (Insufficient Evidence)*

There is insufficient evidence to make a recommendation for or against the use of axial loaded MRI to evaluate the dural sac cross sectional area in patients with degenerative lumbar spondylolisthesis and spinal stenosis. *New recommendation statement; Grade of Recommendation: I (Insufficient Evidence)*

Plain myelography or computed tomography (CT) myelography is useful studies to assess spinal stenosis in patients with degenerative lumbar spondylolisthesis especially in those who have contraindications to MRI. *Maintained from original guideline; Grade of Recommendation: B (Suggested)*

In patients with degenerative lumbar spondylolisthesis with associated spinal stenosis for whom MRI is either contraindicated or inconclusive, CT myelography is suggested as the most appropriate test to confirm the presence of anatomic narrowing of the spinal canal or the presence of nerve root impingement. *New Consensus Statement; Work Group Consensus Statement*

In patients with degenerative spondylolisthesis with associated spinal stenosis for whom MRI and CT myelography are contraindicated, inconclusive or inappropriate, CT is suggested as the most appropriate test to confirm the presence of anatomic narrowing of the spinal canal or the presence of nerve room impingement. *New Consensus Statement; Work Group Consensus Statement*

What Are the Most Appropriate Diagnostic or Physical Exam Tests Consistent with the Diagnosis of Fixed versus Dynamic Deformity?

There is insufficient evidence to make a recommendation on the most appropriate diagnostic or physical exam test consistent with fixed or dynamic deformity in degenerative lumbar spondylolisthesis patients due to the lack of uniform reference standards which define instability.

There is no universally accepted standard to diagnose fixed versus dynamic spondylolisthesis. To evaluate instability, many studies employ the use of lateral flexion extension radiographs, which may be done in the standing or recumbent position; however, there is wide variation in the definition of instability. To assist the readers, the definitions for instability (when provided) in degenerative spondylolisthesis patients, are provided in the original guideline document. *Grade of Recommendation: I (Insufficient Evidence)*

Is Dynamic MRI and/or Dynamic CT Myelography Imaging (Including Standing Imaging, Imaging with Axial Loading) Helpful in the Diagnostic Testing for Degenerative Lumbar Spondylolisthesis?

There is insufficient evidence to make a recommendation for or against the utility of dynamic MRI and dynamic CT myelography in the diagnosis of degenerative lumbar spondylolisthesis. *Grade of Recommendation: I (Insufficient Evidence)*

Outcome Measures for Medical/Interventional and Surgical Treatment

What Are the Appropriate Outcome Measures for the Treatment of Degenerative Lumbar Spondylolisthesis?

An updated literature search was not conducted. For more information on appropriate outcome measures for degenerative lumbar spondylolisthesis, the North American Spine Society (NASS) has a publication entitled Compendium of Outcome Instruments for Assessment and Research of Spinal Disorders. To purchase a copy of the Compendium, visit the [NASS Web site](#) .

Medical and Interventional Treatment

An updated systematic review of the literature yielded no studies to adequately address any of the medical/interventional treatment questions from the original guideline posed below:

- What is the role of pharmacological treatment in the management of degenerative lumbar spondylolisthesis?
- What is the role of physical therapy/exercise in the treatment of degenerative lumbar spondylolisthesis?
- What is the role of manipulation in the treatment of degenerative lumbar spondylolisthesis?
- What is the role of ancillary treatments such as bracing, traction, electrical stimulation and transcutaneous electrical stimulation (TENS) in the treatment of degenerative lumbar spondylolisthesis?
- What is the long-term result (4+ years) of medical/interventional management of degenerative lumbar spondylolisthesis?

What Is the Role of Injections for the Treatment of Degenerative Lumbar Spondylolisthesis?

There is insufficient evidence to make a recommendation for or against the use of injections for the treatment of degenerative lumbar spondylolisthesis. *New recommendation statement; Grade of Recommendation: I (Insufficient Evidence)*

Medical/interventional treatment for degenerative lumbar spondylolisthesis, when the radicular symptoms of stenosis predominate, most logically should be similar to treatment for symptomatic degenerative lumbar spinal stenosis. *Consensus Statement maintained from original guideline; Work Group Consensus Statement*

Surgical Treatment

Does Surgical Decompression Alone Improve Surgical Outcomes in the Treatment of Degenerative Lumbar Spondylolisthesis Compared to Medical/Interventional Treatment Alone?

Direct surgical decompression may be considered for the treatment of patients with symptomatic spinal stenosis associated with low grade degenerative lumbar spondylolisthesis whose symptoms have been recalcitrant to a trial of medical/interventional treatment. *Updated recommendation statement; Grade of Recommendation: C*

There is insufficient evidence to make a recommendation for or against the use of indirect surgical decompression for the treatment of patients with symptomatic spinal stenosis associated with low grade degenerative lumbar spondylolisthesis whose symptoms have been recalcitrant to a trial of medical/interventional treatment. *Maintained from original guideline; Grade of Recommendation: I (Insufficient Evidence)*

Does the Addition of Lumbar Fusion, with or without Instrumentation, to Surgical Decompression Improve Surgical Outcomes in the Treatment of Degenerative Lumbar Spondylolisthesis Compared to Treatment by Decompression Alone?

Surgical decompression with fusion is suggested for the treatment of patients with symptomatic spinal stenosis and degenerative lumbar spondylolisthesis to improve clinical outcomes compared with decompression alone. *Maintained from original guideline with minor word modifications; Grade of Recommendation: B*

For symptomatic single-level degenerative spondylolisthesis that is low-grade (<20%) and without lateral foraminal stenosis, decompression alone with preservation of midline structures provide equivalent outcomes when compared to surgical decompression with fusion. *New recommendation statement; Grade of Recommendation: B (Suggested)*

Does the Addition of Lumbar Fusion, with or without Instrumentation, to Surgical Decompression Improve Surgical Outcomes in the Treatment of Degenerative Lumbar Spondylolisthesis Compared to Medical/Interventional Treatment Alone?

Surgical decompression with fusion, with or without instrumentation, is suggested to improve the functional outcomes of single-level degenerative lumbar spondylolisthesis compared to medical/interventional treatment alone. *Grade of Recommendation: B*

There is insufficient evidence to make a recommendation for or against efficacy of surgical decompression with fusion, with or without instrumentation, for treatment of multi-level degenerative lumbar spondylolisthesis compared to medical/interventional treatment alone. *Grade of Recommendation: I (Insufficient Evidence)*

Does the Addition of Instrumentation to Decompression and Fusion for Degenerative Lumbar Spondylolisthesis Improve Surgical Outcomes Compared with Decompression and Fusion Alone?

The addition of instrumentation is suggested to improve fusion rates in patients with symptomatic spinal stenosis and degenerative lumbar spondylolisthesis. *Maintained from original guideline with minor word modifications; Grade of Recommendation: B*

The addition of instrumentation is not suggested to improve clinical outcomes for the treatment of patients with symptomatic spinal stenosis and degenerative lumbar spondylolisthesis. *Maintained from original guideline with minor word modifications; Grade of Recommendation: B (Suggested)*

How Do Outcomes of Decompression with Posterolateral Fusion Compare with Those for 360° Fusion in the Treatment of Degenerative Lumbar Spondylolisthesis?

For the purposes of this guideline, the work group defined "360° fusion" as a procedure involving interbody fusion.

There is insufficient evidence to make a recommendation for or against the use of either decompression with posterolateral fusion or 360° fusion in the surgical treatment of patients with degenerative lumbar spondylolisthesis. *Maintained from original guideline; Grade of Recommendation: I (Insufficient Evidence)*

Does 360° Fusion with Decompression Lead to Better Outcomes versus 360° Fusion without Decompression for Treatment of Degenerative Lumbar Spondylolisthesis?

No evidence was found to address this question. Due to the paucity of literature addressing this question, the work group was unable to generate a recommendation to answer this question.

Do Flexible Fusions Improve Outcomes in the Treatment of Degenerative Lumbar Spondylolisthesis Compared to Nonoperative Treatment?

For the purposes of this guideline, the work group defined "flexible fusion" as a procedure involving dynamic stabilization without arthrodesis.

No evidence was found to address this question. Due to the paucity of literature addressing this question, the work group was unable to generate a recommendation to answer this question.

Does the Use of Interspinous Spacers in the Treatment of Degenerative Lumbar Spondylolisthesis Improve Outcomes Compared to Medical/Interventional Treatment?

There is insufficient and conflicting evidence to make a recommendation for or against the efficacy of interspinous spacers versus medical/interventional treatment in the management of degenerative lumbar spondylolisthesis patients. *Grade of Recommendation: I (Insufficient Evidence)*

What Is the Role of Reduction (Deliberate Attempt to Reduce via Surgical Technique) with Fusion in the Treatment of Degenerative Lumbar Spondylolisthesis?

There is insufficient evidence to make a recommendation for or against the use of reduction with fusion in the treatment of degenerative lumbar spondylolisthesis. *Revised wording, but Recommendation Grade maintained; Grade of Recommendation: I (Insufficient Evidence)*

The updated literature search did not retrieve new evidence to support a recommendation for or against the use of reduction with fusion; therefore, the work group maintains the original guideline's "Insufficient Recommendation" grading. Although reduction and fusion can be performed, the evidence reviewed does not substantiate any improvement in clinical outcomes and reduction may increase the risk of neurological complications.

For Patients Undergoing Posterolateral Fusion, Does the Use of Autogenous Bone Graft Improve Surgical Outcomes Compared to Those Fused with Bone Graft Substitutes?

Due to the paucity of literature addressing this question, the work group was unable to generate a recommendation to answer this question.

There is insufficient evidence to make a recommendation for or against the use of autogenous bone graft or bone graft substitutes in patients undergoing posterolateral fusion for the surgical treatment of degenerative lumbar spondylolisthesis. *Grade of Recommendation: I (Insufficient Evidence)*

Do Minimally Invasive Surgical Treatments Improve Outcomes in the Treatment of Degenerative Lumbar Spondylolisthesis Compared to:

- a. Conventional open decompression (laminectomy)?
- b. Conventional (open) lumbar decompression and fusion, with or without instrumentation?

No evidence was found to assess the efficacy of minimally invasive surgical techniques versus open decompression alone in the surgical treatment of degenerative lumbar spondylolisthesis.

While both minimally invasive techniques and open decompression and fusion, with or without instrumentation, demonstrate significantly improved clinical outcomes for the surgical treatment of degenerative lumbar spondylolisthesis, there is conflicting evidence which technique leads to better outcomes. *Grade of Recommendation: I (Insufficient/Conflicting Evidence)*

What Is the Long-term Result (4 or More Years) of Surgical Management of Degenerative Lumbar Spondylolisthesis?

Decompression and fusion may be considered as a means to provide satisfactory long-term results for the treatment of patients with symptomatic spinal stenosis and degenerative lumbar spondylolisthesis. *Maintained from original guideline with minor word modifications; Grade of Recommendation: C*

Which Patient-specific Characteristics Influence Outcomes (and Prognosis) in the Treatment (Surgical or Any) of Degenerative Lumbar Spondylolisthesis?

There is insufficient evidence to make a recommendation for or against the influence of a nonorganic pain drawing on the outcomes/prognosis of treatments for patients with degenerative lumbar spondylolisthesis. *Grade of Recommendation: I (Insufficient Evidence)*

There is insufficient evidence to make a recommendation regarding the influence of age and three or more comorbidities on the outcomes of patients undergoing treatment for degenerative lumbar spondylolisthesis. *Grade of Recommendation: I (Insufficient Evidence)*

There is insufficient evidence to make a recommendation regarding the influence of symptom duration on the treatment outcomes of patients with degenerative lumbar spondylolisthesis. *Grade of Recommendation: I (Insufficient Evidence)*

There is insufficient evidence to make a recommendation regarding the influence of obesity (body mass index [BMI] >30) and its impact on treatment outcomes in patients with degenerative lumbar spondylolisthesis. *Grade of Recommendation: I (Insufficient Evidence)*

What Is the Effect of Postsurgical Rehabilitation Including Exercise, Spinal Mobilization/Manipulation or Psychosocial Interventions on Outcomes in the Management of Degenerative Lumbar Spondylolisthesis (Compared to Patients Who Do Not Undergo Postsurgical Rehabilitation)?

There was no evidence found to address this question. Due to the paucity of evidence, a recommendation cannot be made regarding the effect of postsurgical rehabilitation the outcomes of patients undergoing surgical treatment for degenerative lumbar spondylolisthesis.

Value of Spine Care

What Is the Cost-effectiveness of the Surgical Treatment of Degenerative Lumbar Spondylolisthesis Compared to Medical/Interventional Treatment (Consider with and without Fusion Separately)?

There was no evidence found to address this question. Due to the paucity of evidence, a recommendation cannot be made regarding the cost-effectiveness of surgical treatment compared to medical/interventional treatment for the management of patients with degenerative lumbar spondylolisthesis.

What Is the Cost-effectiveness of Minimal Access-based Surgical Treatments of Degenerative Lumbar Spondylolisthesis Compared to Traditional Open Surgical Treatments?

There is insufficient evidence to make a recommendation for or against the cost-effectiveness of minimal access-based surgical treatments compared to traditional open surgical treatments for degenerative lumbar spondylolisthesis. *Grade of Recommendation: I (Insufficient Evidence)*

Definitions:

Grades of Recommendation for Summaries or Reviews of Studies

A: Good evidence (Level I studies with consistent findings) for or against recommending intervention.

B: Fair evidence (Level II or III studies with consistent findings) for or against recommending intervention.

C: Poor quality evidence (Level IV or V studies) for or against recommending intervention.

I: Insufficient or conflicting evidence not allowing a recommendation for or against intervention.

Linking Levels of Evidence to Grades of Recommendations

Grade of Recommendation	Standard Language	Levels of Evidence	
A	Recommended	Two or more consistent Level I studies	
B	Suggested	One Level I study with additional supporting Level II or III studies	Two or more consistent Level II or III studies

C	Grade of Recommendation	Standard Language	Levels of Evidence
		May be considered; is an option	One Level I, II or III study with supporting Level IV studies
			Two or more consistent Level IV studies
	I (Insufficient or conflicting evidence)	Insufficient evidence to make recommendation for or against	A single Level I, II, III or IV study without other supporting evidence
			More than one study with inconsistent findings*
*Note that in the presence of multiple consistent studies, and a single outlying, inconsistent study, the Grade of Recommendation will be based on the level of consistent studies.			

Levels of Evidence for Primary Research Question¹

	Types of Studies			
	Therapeutic Studies – Investigating the results of treatment	Prognostic Studies – Investigating the effect of a patient characteristic on the outcome of disease	Diagnostic Studies – Investigating a diagnostic test	Economic and Decision Analyses – Developing an economic or decision model
Level I	<ul style="list-style-type: none"> High quality randomized trial with statistically significant difference or no statistically significant difference but narrow confidence intervals Systematic review² of Level I RCTs (and study results were homogenous³) 	<ul style="list-style-type: none"> High quality prospective study⁴ (all patients were enrolled at the same point in their disease with ≥80% follow-up of enrolled patients) Systematic review² of Level I studies 	<ul style="list-style-type: none"> Testing of previously developed diagnostic criteria on consecutive patients (with universally applied reference "gold" standard) Systematic review² of Level I studies 	<ul style="list-style-type: none"> Sensible costs and alternatives; values obtained from many studies; with multiway sensitivity analyses Systematic review² of Level I studies
Level II	<ul style="list-style-type: none"> Lesser quality RCT (e.g., <80% follow-up, no blinding, or improper randomization) Prospective⁴ comparative study⁵ Systematic review² of Level II studies or Level I studies with inconsistent results 	<ul style="list-style-type: none"> Retrospective⁶ study Untreated controls from an RCT Lesser quality prospective study (e.g., patients enrolled at different points in their disease or <80% follow-up) Systematic review² of Level II studies 	<ul style="list-style-type: none"> Development of diagnostic criteria on consecutive patients (with universally applied reference "gold" standard) Systematic review² of Level II studies 	<ul style="list-style-type: none"> Sensible costs and alternatives; values obtained from limited studies; with multiway sensitivity analyses Systematic review² of Level II studies
Level III	<ul style="list-style-type: none"> Case control study⁷ Retrospective⁶ comparative study⁵ Systematic review² of Level III studies 	<ul style="list-style-type: none"> Case control study⁷ 	<ul style="list-style-type: none"> Study of nonconsecutive patients; without consistently applied reference "gold" standard Systematic review² of Level III studies 	<ul style="list-style-type: none"> Analyses based on limited alternatives and costs; and poor estimates Systematic review² of Level III studies
Level IV	Case series ⁸	Case series	<ul style="list-style-type: none"> Case-control study Poor reference standard 	<ul style="list-style-type: none"> Analyses with no sensitivity analyses
Level V	Expert Opinion	Expert Opinion	Expert Opinion	Expert Opinion

RCT, randomized controlled trial

¹ A complete assessment of quality of individual studies requires critical appraisal of all aspects of the study design.

²A combination of results from two or more prior studies.

³Studies provided consistent results.

⁴Study was started before the first patient enrolled.

⁵Patients treated one way (e.g., cemented hip arthroplasty) compared with a group of patients treated in another way (e.g., uncemented hip arthroplasty) at the same institution.

⁶The study was started after the first patient enrolled.

⁷Patients identified for the study based on their outcome, called "cases" (e.g., failed total arthroplasty) are compared to those who did not have outcome, called "controls" (e.g., successful total hip arthroplasty).

⁸Patients treated one way with no comparison group of patients treated in another way.

Clinical Algorithm(s)

None provided

Scope

Disease/Condition(s)

Degenerative lumbar spondylolisthesis

Guideline Category

Diagnosis

Evaluation

Management

Treatment

Clinical Specialty

Chiropractic

Family Practice

Internal Medicine

Neurological Surgery

Neurology

Orthopedic Surgery

Physical Medicine and Rehabilitation

Intended Users

Advanced Practice Nurses

Health Care Providers

Nurses

Physical Therapists

Physician Assistants

Physicians

Guideline Objective(s)

- To provide evidence-based recommendations to address key clinical questions surrounding the diagnosis and treatment of degenerative lumbar spondylolisthesis
- To update the original guideline on this topic, published in 2008
- To assist in delivering optimum, efficacious treatment and functional recovery from this spinal disorder
- To provide a tool that assists practitioners in improving the quality and efficiency of care delivered to these patients

Target Population

Adults (18 years or older) with a chief complaint of low back pain and/or lower extremity symptoms related to spinal stenosis and degenerative lumbar spondylolisthesis

Interventions and Practices Considered

Diagnosis/Evaluation

1. History and physical examination
2. Imaging studies
 - Lateral radiograph
 - Magnetic resonance imaging (MRI)
 - Plain and computed tomography (CT) myelography
 - CT scan
 - Dynamic MRI and/or dynamic CT myelography
3. Use of outcome measures
4. Physical exam tests to diagnose fixed versus dynamic deformity

Management/Treatment

1. Medical and interventional treatments
2. Surgical treatments
 - Direct surgical decompression
 - Indirect surgical decompression
 - Surgical decompression with fusion
 - Instrumentation in addition to decompression and fusion
 - 360° fusion with or without decompression
 - Flexible fusions
 - Use of interspinous spacers
 - Reduction with fusion
 - Use of autogenous bone graft
 - Minimally invasive surgical treatments
3. Postsurgical rehabilitation including exercise, spinal mobilization/manipulation or psychosocial interventions

Note: Recommendations for use were not made for many of the listed interventions/practices because of inadequate evidence. See the "Major Recommendations" field.

Major Outcomes Considered

- Appropriateness and diagnostic utility of patient history, physical exam, and imaging tests

- Quality of life
- Relief of pain and other symptoms as measured by validated instruments (e.g., Visual Analog Scale [VAS] and Oswestry Disability Index [ODI])
- Patient satisfaction
- Complication rates
- Functional outcomes
- Reoperation rates
- Cost-effectiveness of treatments

Methodology

Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Hand-searches of Published Literature (Secondary Sources)

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Identification of Clinical Questions

The clinical questions from the original guideline, published in 2008, are included in this guideline update. Since 2008, an additional section addressing value in spine care has been added. Trained guideline participants were asked to submit a list of new additional clinical questions that the guideline should address in addition to the questions included in the original guideline. The lists of new questions were compiled into a master list, which was then circulated to each member with a request that they independently rank the questions in order of importance for consideration in the guideline. The questions from the previous guideline and most highly ranked new questions, as determined by the participants, served to focus the guideline.

Identification of Search Terms and Parameters

One of the most crucial elements of evidence analysis is the comprehensive literature search. Thorough assessment of the literature is the basis for the review of existing evidence and the formulation of evidence-based recommendations. In order to ensure a thorough literature search, the North American Spine Society (NASS) has instituted a Literature Search Protocol (see Appendix E in the original guideline document) which has been followed to identify literature for evaluation in guideline development. In keeping with the Literature Search Protocol, work group members have identified appropriate search terms and parameters to direct the literature search. Specific search strategies, including search terms, parameters and databases searched, are documented in the technical report that accompanies this guideline (see the "Availability of Companion Documents" field).

Completion of the Literature Search

Once each work group identified search terms/parameters, the literature search was implemented by a medical/research librarian at InfoNOW at the University of Minnesota, consistent with the Literature Search Protocol. Following these protocols ensures that NASS recommendations (1) are based on a thorough review of relevant literature; (2) are truly based on a uniform, comprehensive search strategy; and (3) represent the current best research evidence available. NASS maintains a search history in Endnote, for future use or reference.

Literature Search Strategy

The guideline is based on a systematic review of the evidence. The updated literature search was conducted in May 2013.

Databases Searched

- Medline/PubMed
- The Cochrane Library
- EMBASE

Article reference lists were also searched. Duplicate records were eliminated.

Inclusion Criteria

- Humans
- English language
- Addresses clinical question
- If mixed diagnosis study, results must include subgroup analysis of outcomes for degenerative spondylolisthesis patients only
- Date range for revised questions: January 2007 to May 2013
- Date range for new questions: All literature to May 2013

Review of Search Results/Identification of Literature to Review

Work group members reviewed all abstracts yielded from the literature search and identified the literature they will review in order to address the clinical questions, in accordance with the Literature Search Protocol. Members have identified the best research evidence available to answer the targeted clinical questions. That is, if Level I, II and or III literature is available to answer specific questions, the work group was not required to review Level IV or V studies.

Number of Source Documents

The developer provided literature attrition flowcharts.

Methods Used to Assess the Quality and Strength of the Evidence

Expert Consensus (Committee)

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Levels of Evidence for Primary Research Question¹

	Types of Studies			
	Therapeutic Studies – Investigating the results of treatment	Prognostic Studies – Investigating the effect of a patient characteristic on the outcome of disease	Diagnostic Studies – Investigating a diagnostic test	Economic and Decision Analyses – Developing an economic or decision model
Level I	<ul style="list-style-type: none"> • High quality randomized trial with statistically significant difference or no statistically significant difference but narrow confidence intervals • Systematic review² of Level I RCTs (and study results were homogenous³) 	<ul style="list-style-type: none"> • High quality prospective study⁴ (all patients were enrolled at the same point in their disease with ≥80% follow-up of enrolled patients) • Systematic review² of Level I studies 	<ul style="list-style-type: none"> • Testing of previously developed diagnostic criteria on consecutive patients (with universally applied reference "gold" standard) • Systematic review² of Level I studies 	<ul style="list-style-type: none"> • Sensible costs and alternatives; values obtained from many studies; with multiway sensitivity analyses • Systematic review² of Level I studies
Level II	<ul style="list-style-type: none"> • Lesser quality RCT (e.g., <80% follow-up, no blinding, or improper randomization) • Prospective⁴ comparative study⁵ • Systematic review² of 	<ul style="list-style-type: none"> • Retrospective⁶ study • Untreated controls from an RCT • Lesser quality prospective study (e.g., patients enrolled at different points in their disease or <80% 	<ul style="list-style-type: none"> • Development of diagnostic criteria on consecutive patients (with universally applied reference "gold" standard) • Systematic review² of 	<ul style="list-style-type: none"> • Sensible costs and alternatives; values obtained from limited studies; with multiway sensitivity

	Level II studies or Level I studies with inconsistent results	follow-up) Types of Studies	Level II studies	analyses
	Therapeutic Studies – Investigating the results of treatment	• Systematic review ² of Prognostic Studies – Investigating the effect of a patient characteristic on the outcome of disease	Diagnostic Studies – Investigating a diagnostic test	• Systematic review ² of Level II studies Economic and Decision Analyses – Developing an economic or decision model
Level III	<ul style="list-style-type: none"> • Case control study⁷ • Retrospective⁶ comparative study⁵ • Systematic review² of Level III studies 	<ul style="list-style-type: none"> • Case control study⁷ 	<ul style="list-style-type: none"> • Study of nonconsecutive patients; without consistently applied reference "gold" standard • Systematic review² of Level III studies 	<ul style="list-style-type: none"> • Analyses based on limited alternatives and costs; and poor estimates • Systematic review² of Level III studies
Level IV	Case series ⁸	Case series	<ul style="list-style-type: none"> • Case-control study • Poor reference standard 	<ul style="list-style-type: none"> • Analyses with no sensitivity analyses
Level V	Expert Opinion	Expert Opinion	Expert Opinion	Expert Opinion

RCT, randomized controlled trial

¹A complete assessment of quality of individual studies requires critical appraisal of all aspects of the study design.

²A combination of results from two or more prior studies.

³Studies provided consistent results.

⁴Study was started before the first patient enrolled.

⁵Patients treated one way (e.g., cemented hip arthroplasty) compared with a group of patients treated in another way (e.g., uncemented hip arthroplasty) at the same institution.

⁶The study was started after the first patient enrolled.

⁷Patients identified for the study based on their outcome, called "cases" (e.g., failed total arthroplasty) are compared to those who did not have outcome, called "controls" (e.g., successful total hip arthroplasty).

⁸Patients treated one way with no comparison group of patients treated in another way.

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

Evidence Analysis

Members have independently developed evidentiary tables summarizing study conclusions, identifying strengths and weaknesses and assigning levels of evidence. In order to systematically control for potential biases, at least two work group members have reviewed each article selected and independently assigned levels of evidence to the literature using the North American Spine Society (NASS) levels of evidence (see the "Rating Scheme for the Strength of the Evidence" field). Any discrepancies in scoring have been addressed by two or more reviewers. Final ratings are completed at a final meeting of all section workgroup members including the section chair and the guideline chair. The consensus level (the level upon which two-thirds of reviewers were in agreement) was then assigned to the article.

As a final step in the evidence analysis process, members have identified and documented gaps in the evidence to educate guideline readers about where evidence is lacking and help guide further needed research by NASS and other societies.

Levels of Evidence

In evaluating studies as to levels of evidence for this guideline, the study design was interpreted as establishing only a potential level of evidence. As an example, a therapeutic study designed as a randomized controlled trial would be considered a potential Level I study. The study would then be further analyzed as to how well the study design was implemented and significant shortcomings in the execution of the study would be used to downgrade the levels of evidence for the study's conclusions. In the example cited previously, reasons to downgrade the results of a potential Level I randomized controlled trial to a Level II study would include, among other possibilities: an underpowered study (patient sample too small, variance too high), inadequate randomization or masking of the group assignments and lack of validated outcome measures.

In addition, a number of studies were reviewed several times in answering different questions within this guideline. How a given question was asked might influence how a study was evaluated and interpreted as to its level of evidence in answering that particular question. For example, a randomized controlled trial reviewed to evaluate the differences between the outcomes of surgically treated versus untreated patients with lumbar disc herniation with radiculopathy might be a well designed and implemented Level I therapeutic study. This same study, however, might be classified as providing Level II prognostic evidence if the data for the untreated controls were extracted and evaluated prognostically.

Methods Used to Formulate the Recommendations

Expert Consensus (Nominal Group Technique)

Description of Methods Used to Formulate the Recommendations

Identification of Work Groups

Multidisciplinary teams were assigned to work groups and assigned specific clinical questions to address. Because North American Spine Society (NASS) is comprised of surgical, medical and interventional specialists, it is imperative to the guideline development process that a cross-section of NASS membership is represented on the work group. This also helps to ensure that the potential for inadvertent biases in evaluating the literature and formulating recommendations is minimized.

Formulation of Evidence-Based Recommendations and Incorporation of Expert Consensus

Work groups held web conferences and face-to-face meetings to discuss the evidence-based answers to the clinical questions, the grades of recommendations and the incorporation of expert consensus. Work group members incorporated evidence findings from the original guideline in the guideline update. Where there was no new evidence, the work group re-reviewed the original literature and recommendation statements to ensure agreement with original findings. When new literature was found, work group members included existing evidence when updating recommendations statements.

Expert consensus was incorporated only where Level I-IV evidence is insufficient and the work group has deemed that a recommendation is warranted. Transparency in the incorporation of consensus is crucial, and all consensus-based recommendations made in this guideline very clearly indicate that Level I-IV evidence is insufficient to support a recommendation and that the recommendation is based only on expert consensus.

Consensus Development Process

Voting on guideline recommendations was conducted using a modification of the nominal group technique in which each work group member independently and anonymously ranked a recommendation on a scale ranging from 1 ("extremely inappropriate") to 9 ("extremely appropriate"). Consensus was obtained when at least 80% of work group members ranked the recommendation as 7, 8 or 9. When the 80% threshold was not attained, up to three rounds of discussion and voting were held to resolve disagreements. If disagreements were not resolved after these rounds, no recommendation was adopted.

After the recommendations were established, work group members developed the guideline content, addressing the literature supporting the recommendations.

Rating Scheme for the Strength of the Recommendations

Grades of Recommendation for Summaries or Reviews of Studies

A: Good evidence (Level I studies with consistent findings) for or against recommending intervention.

B: Fair evidence (Level II or III studies with consistent findings) for or against recommending intervention.

C: Poor quality evidence (Level IV or V studies) for or against recommending intervention.

I: Insufficient or conflicting evidence not allowing a recommendation for or against intervention.

Linking Levels of Evidence to Grades of Recommendations

Grade of Recommendation	Standard Language	Levels of Evidence	
A	Recommended	Two or more consistent Level I studies	
B	Suggested	One Level I study with additional supporting Level II or III studies	Two or more consistent Level II or III studies
C	May be considered; is an option	One Level I, II or III study with supporting Level IV studies	Two or more consistent Level IV studies
I (Insufficient or conflicting evidence)	Insufficient evidence to make recommendation for or against	A single Level I, II, III or IV study without other supporting evidence	More than one study with inconsistent findings*
*Note that in the presence of multiple consistent studies, and a single outlying, inconsistent study, the Grade of Recommendation will be based on the level of consistent studies.			

Cost Analysis

The guideline developers reviewed published cost analyses (see Section E, "Value of Spine Care," in the original guideline document). Due to the paucity of evidence, a recommendation could not be made regarding the cost-effectiveness of surgical treatment compared to medical/interventional treatment for the management of patients with degenerative lumbar spondylolisthesis. There was also insufficient evidence to make a recommendation for or against the cost-effectiveness of minimal access-based surgical treatments compared to traditional open surgical treatments for degenerative lumbar spondylolisthesis.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

Submission of the Draft Guidelines for Review/Comment

Guidelines were submitted to the full Evidence-Based Guideline Development Committee and the Research Council for review and comment. Revisions to recommendations were considered for incorporation only when substantiated by a preponderance of appropriate level evidence.

Submission for Board Approval

Once any evidence-based revisions were incorporated, the drafts were prepared for North American Spine Society (NASS) Board review and approval. Edits and revisions to recommendations and any other content were considered for incorporation only when substantiated by a preponderance of appropriate level evidence.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of supporting evidence is identified and graded for each recommendation (see the "Major Recommendations" field).

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Accurate diagnosis and effective treatment of degenerative lumbar spondylolisthesis

Potential Harms

Surgical procedures for degenerative lumbar spondylolisthesis carry the risk of complications including bleeding (inside and outside the spinal cord), transient foot drop, pseudarthrosis, dural tears, wound infection, wound dehiscence, necrotic wounds, and continuing back pain.

Qualifying Statements

Qualifying Statements

- This guideline does not represent a "standard of care," nor is it intended as a fixed treatment protocol. It is anticipated that there will be patients who will require less or more treatment than the average. It is also acknowledged that in atypical cases, treatment falling outside this guideline will sometimes be necessary. This guideline should not be seen as prescribing the type, frequency or duration of intervention. Treatment should be based on the individual patient's need and doctor's professional judgment. This document is designed to function as a guideline and should not be used as the sole reason for denial of treatment and services. This guideline is not intended to expand or restrict a health care provider's scope of practice or to supersede applicable ethical standards or provisions of law.
- This clinical guideline should not be construed as including all proper methods of care or excluding other acceptable methods of care reasonably directed to obtaining the same results. The ultimate judgment regarding any specific procedure or treatment is to be made by the physician and patient in light of all circumstances presented by the patient and the needs and resources particular to the locality or institution.

Implementation of the Guideline

Description of Implementation Strategy

These guidelines are developed for educational purposes to assist practitioners in their clinical decision making processes. It is anticipated that where evidence is very strong in support of recommendations, these recommendations will be operationalized into performance measures.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

Living with Illness

IOM Domain

Effectiveness

Patient-centeredness

Identifying Information and Availability

Bibliographic Source(s)

North American Spine Society (NASS). Diagnosis and treatment of degenerative lumbar spondylolisthesis. Burr Ridge (IL): North American Spine Society (NASS); 2014. 119 p. [636 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2008 (revised 2014)

Guideline Developer(s)

North American Spine Society - Medical Specialty Society

Source(s) of Funding

This clinical guideline was developed and funded in its entirety by the North American Spine Society (NASS).

Guideline Committee

North American Spine Society (NASS) Evidence-Based Clinical Guidelines Committee

Composition of Group That Authored the Guideline

Committee Members: Paul Matz, MD (*Committee Co-Chair and Surgical Treatment Section Chair*); R.J. Meagher, MD (*Diagnosis/Imaging Section Chair*); Tim Lamer, MD (*Medical/Interventional Section Chair*); William Tontz Jr, MD (*Surgical Treatment and Value Section Chair*); Thiru M. Annaswamy, MD; R. Carter Cassidy, MD; Charles H. Cho, MD, MBA; Paul Dougherty, DC; John E. Easa, MD; Dennis E. Enix, DC, MBA; Bryan A. Gunnoe, MD; Jack Jallo, MD, PhD, FACS; Terrence D. Julien, MD; Matthew B. Maserati, MD; Robert C. Nucci, MD; John E. O'Toole, MD, MS; Jonathan N. Sembrano, MD; Alan T. Villavicencio, MD; Jens-Peter Witt, MD

Financial Disclosures/Conflicts of Interest

All participants involved in guideline development have disclosed potential conflicts of interest to their colleagues in accordance with [North American Spine Society \(NASS\) Disclosure Policy](#) for committee members and their potential conflicts have been documented in the original guideline document. NASS does not restrict involvement in guidelines based on conflicts as long as members provide full disclosure. Individuals with a conflict relevant to the subject matter were asked to recuse themselves from deliberation. Participants have been asked to update their disclosures regularly throughout the guideline development process.

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: North American Spine Society (NASS). Diagnosis and treatment of degenerative lumbar spondylolisthesis. Burr Ridge (IL): North American Spine Society (NASS); 2008. 133 p. [191 references]

This guideline meets NGC's 2013 (revised) inclusion criteria.

Guideline Availability

Electronic copies: Available from the [North American Spine Society \(NASS\) Web site](#) .

Print copies: Available from the North American Spine Society (NASS), 7075 Veterans Boulevard, Burr Ridge, IL 60527; Toll-free: (866) 960-6277. An order form is available from the [North American Spine Society Web site](#) .

Availability of Companion Documents

The following is available:

- North American Spine Society evidence-based guidelines: diagnosis and treatment of degenerative lumbar spondylolisthesis (revision). Technical report. Burr Ridge (IL): North American Spine Society; 2014. 226 p. Electronic copies: Available in from the [North American Spine Society \(NASS\) Web site](#) .

Print copies: Available from the North American Spine Society (NASS), 7075 Veterans Boulevard, Burr Ridge, IL 60527; Toll-free: (866) 960-6277. An order form is available from the [North American Spine Society Web site](#) .

Patient Resources

None available

NGC Status

This NGC summary was completed by ECRI Institute on September 5, 2008. The information was verified by the guideline developer on September 8, 2008. This summary was updated by ECRI Institute on March 2, 2015.

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